Confidential Memorandum

To: Fred Baker and Ingrid Moll, Motley Rice LLC
Kelly Burch, Office of the Oklahoma Attorney-General
David Riggs and David Page, Riggs, Abney, Neal, Turpen, Orbison & Lewis, Inc.

From: David Allen and David Chapman, Stratus Consulting Inc.

Date: 3/21/2008

Subject: Survey Instrument Development, Scientific Input, and Next Steps: Part II

This memorandum updates our memorandum of May 23, 2007 (attached). In order to stay on a schedule that will allow us to complete the expert reports by January 2009, we have scheduled the first pilot test of the draft survey instrument. The pilot will take place in April 2008 and has been scheduled with Westat, Inc.

Per previous discussions, we believe that a minimum of two pilot tests are required to ensure an effective survey instrument for the full study this summer. However, per our May 23, 2007 memorandum, we need to complete the process of reaching resolution with the injury team about how injuries are described in the survey instrument (Point A in Figure 3 of attached memorandum), and the timeline over which recovery of injuries will take place after a moratorium (Segment AB in Figure 3 of attached memorandum).

We have had discussions with key members of the injury team about the description of injuries (Point A). However, at this time we have not seen the injury reports and the modelers continue to work on the projections of recovery after the moratorium, so we have had to make a best guess about the overall degree of injury and the timeline for recovery (Segment AB) based on our discussions. If the injury team reaches conclusions that are substantially different than the descriptions of injuries and timelines in the current survey instrument, then the survey will need to be changed enough that one additional pilot test may be insufficient to finalize the instrument for the main survey this summer.

An additional pilot test would require additional budget and time that could delay our ability to complete the expert reports by January 2009. However, delaying the first pilot test would also require additional budget and time and could delay our ability to complete the expert reports by January 2009. We have been unsuccessful in convening a meeting with the legal team and injury team in advance of the first pilot test to address these and other issues, partly because the modelers continue to work on their projections, and partly because of the demands on the legal team and injury team caused by the injunction hearings. Therefore, to stay on the current timeline, we have scheduled the first pilot test in hope that the injury team's results will not deviate significantly from the injury and timeline descriptions in the current survey instrument.

As soon as possible, we should convene a meeting between the injury team, legal team, and economics team to discuss these key issues, as well as a number of other important issues, which could influence the substance, cost, and timing of the full economic study.

Confidential Memorandum

To: Fred Baker, Motley Rice LLC
Kelly Burch, Office of the Oklahoma Attorney-General
David Page, Bell Legal Group
David Riggs, Riggs, Abney, Neal, Turpen, Orbison & Lewis, Inc.

From: David Allen and David Chapman, Stratus Consulting Inc.

Date: 5/23/2007

Subject: Survey Instrument Development, Scientific Input, and Next Steps

The economics team is endeavoring to stay on the agreed schedule for completing its damage estimates (Phases I and II, as described in our January 29, 2007 memorandum). We are quickly moving toward finalization of the survey instrument for pre-testing in the field. To complete this work, we need to increase our communication with the injury team to ensure that the description of injuries in our survey matches the results of the work being done by the injury team. In addition, the economics team needs additional injury information from the scientists.

This memorandum provides guidance about injury team reviews and information needed by the economics team, as well as an update regarding the timing of Phase II of our economics work, which will need to be approved before the completion of Phase I, most likely during the summer of 2007.

1. Injury Team Estimates of Timelines and Review of Injury Descriptions

1.1 Injury Team Estimates of Injury Timelines

The economics survey instrument is being designed to measure the public value of losses caused by poultry companies' releases of contamination, accounting for any response actions (moratorium, injunctive relief, cleanup) that would decrease public losses.[1] The injury team will need to provide injury timelines that match their determination of justified, realistic injunctive relief and cleanup.[2] These timelines are tied to descriptions of specific injuries and recovery paths in the survey instrument. The recovery paths are based on assumptions about how natural resources will respond to justifiable, realistic injunctive relief and cleanup and must be estimated by the injury team, probably to at least the nearest decade.

1. The natural resource damages claim is then added to any injunctive relief or cleanup costs, as well as to any penalties or punitive damages.

2. Justification presumably will be based on risk analysis, and realism on cleanup criteria.

Diagrams (Figures 1-3) may help explain the information needed by the economics team. On each diagram, time is on the horizontal axis and a natural resource service is on the vertical axis. Examples of services include water clarity as it affects people's enjoyment of the river and lake as they view it and engage in water contact activities; ecosystem authenticity, such as the presence or absence of endemic species of fish, other animals, and plants; and presence or absence of drinking water that is healthful with appealing taste and odor.

Figure 1 depicts the past and future timeline of injury to a resource's service in the absence of injunctive relief.

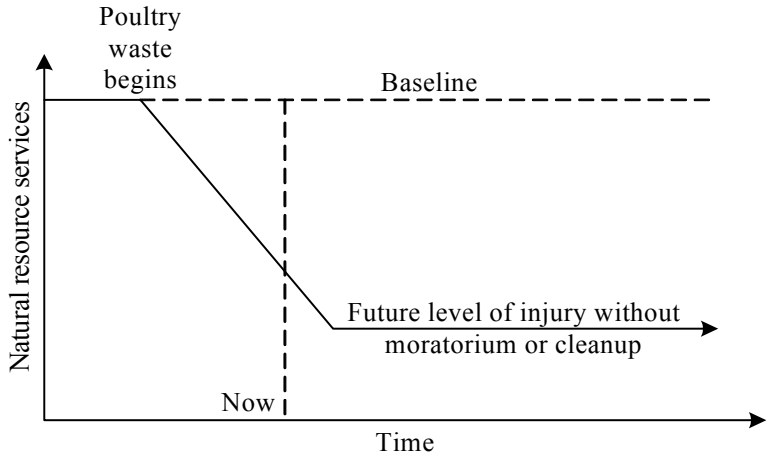

Figure 1. Hypothetical losses with no moratorium or cleanup.

Figure 2 adds in a timeline for injury with injunctive relief and cleanup.[3]

If the resource service is water clarity, and some sort of moratorium on spreading of chicken litter goes into place, then presumably water clarity will improve over time. As Figure 2 is drawn, the resource service would eventually return to baseline, but it is also possible that there would be a permanent, residual injury.

3. Note that the area between the lines with and without moratorium/cleanup represents natural resource damages that would be prevented by the moratorium and cleanup actions. Therefore, these are not included in the economic valuation of the natural resource damages that we expect will occur (with justifiable, realistic moratorium/cleanup). However, the cost of the moratorium/cleanup is one element of the total claim, to which natural resource damages are added as another part of the claim (and both are added to any penalties or punitive damages). Also note that the costs of moratorium/cleanup could also be thought of as the costs of "baseline restoration" under NRDA, if the same actions were driven NRDA instead of by risk justifications for injunctive relief and cleanup.

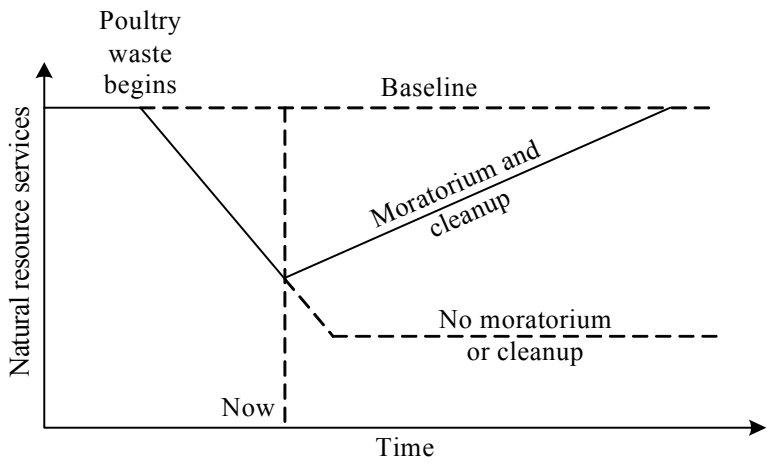

Figure 2. Hypothetical losses with moratorium and cleanup.

It is very important that the survey reflect the scientists' best estimates of what the moratorium and cleanup timeline would look like for each resource service. It forms the basis for valuation of damages in a way that is illustrated in Figure 3.

In Figure 3, Line 2 is the moratorium and cleanup timeline carried over from Figure 2. Line 1 needs a bit more explanation. We are working to value the future losses in natural resource services that citizens will bear even though a moratorium and cleanup will have occurred. Unfortunately, it is not practical to design a contingent valuation question that simply asks people what these residual injuries after cleanup are worth to them. There are many reasons for this, including that people would have a tendency to state high values for strategic reasons. So, instead, our measure of damages will be the willingness of Oklahoma residents to pay for greatly accelerated recovery of the river, lake, and groundwater if it were possible to do so (Line 1). We are using the idea of alum treatments that accelerate cleanup as a way to help respondents think through this possibility and their willingness to pay for it. In Figure 3, we are in essence asking them their value for the resource services in the shaded area ABC.

So, Line 2 is extremely important to the economics team. We will depend on the environmental modeling work of the scientists to help us define Line 2 for each of the resource services being addressed in our survey. Soon, the economics team will be unable to proceed further without reasonable modeling results that the scientists support because we can make only minor adjustments after our first pretest.

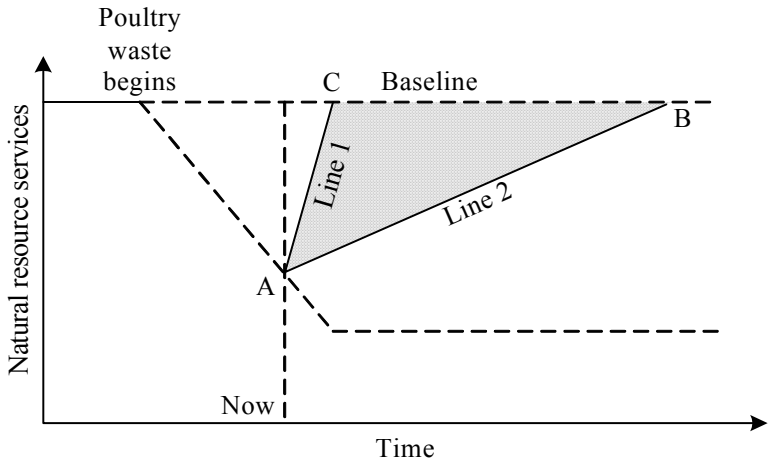

Figure 3. Hypothetical losses targeted by the survey instrument. Line 1 is a hypothetical fast recovery pathway. Line 2 is the expected recovery with moratorium and cleanup.

1.2 Injury Team Review of Information in the Economic Instrument

In the attachment, we provide excerpts from the current survey instrument that describe our understanding of the current conditions of the river, lake, and groundwater, and recovery of the system as a result of justified, realistic injunctive relieve and/or cleanup. We have highlighted specific text in yellow that needs verification and documentation by, and attribution to, an appropriate member of the injury team. We have begun this review with injury scientists for specific aspects of the lake injury description. We need to complete that effort and launch and complete similar reviews for other components of the injury scenario, and then also incorporate the results of the injury modeling efforts. For each of the highlighted sections in the attachment, we need to identify specific experts and references to specific study results or other available information supporting the statements.

The Green Bay natural resource damage assessment illustrates the kind of information that the economics team needs from the injury team. For Green Bay, PCB-caused injuries included: water quality standards violations; exceedence of sediment disposal thresholds; fish consumption advisories; waterfowl consumption advisories; exceedence of biological injury thresholds in water, sediments, and tissues; pre-cancerous lesions in walleye; reproductive effects in birds; and deformities in birds. The formal determinations that establish those injuries comprise approximately 700 pages in six formal pathway and injury reports (the injury team may wish to scan the documents at http://www.fws.gov/midwest/FoxRiverNRDA/).

In addition, the U.S. Environmental Protection Agency and the Wisconsin Department of Natural Resources spent over $10 million to construct hydrodynamic models of the Fox River and Green Bay, linked to sediment transport models, then linked to PCB fate and transport models, and then linked to food web models (see http://www.epa.gov/glnpo/monitoring/data_proj/gbmb/index.html). Thousands of pages of modeling reports were then distilled into key predictions about the effect of remedial options on PCB concentrations in various media (see http://dnr.wi.gov/org/water/wm/foxriver/documents/whitepapers/Administrative_Record_Index.pdf).

The injury team for the Green Bay natural resource damage assessment used these large bodies of work on natural resource injuries, and predicted effects of remedial options, to help the economics team construct the injury description in an economics survey, as well as the timelines for injury under realistic remedial options. The survey instrument used timelines of 20 years, 40 years, 70 years, and 100 years, based on the various modeling results (and which required merging of different timelines for different injury endpoints). The injury team may wish to review pages 299-300 of http://www.fws.gov/midwest/FoxRiverNRDA/documents/RCDP-1.pdf for an example of how injury information can be synthesized for use in an economics instrument.

2. Timeline for the Economics Team

The economics team has made much progress in developing the survey instrument. We have conducted focus groups in a number of locations throughout the State to develop and test descriptions of injuries, solutions to contamination problems, and payment mechanism (the surrogate for value). The text of the survey instrument is working well across geographic locations, socioeconomic strata, and education levels within the state.

During the next four to six weeks, we are prepared to complete the development and testing of additional components of the survey instrument in anticipation of pre-testing the instrument in the field. These components include:

- Continuing to refine the description of the injury through contacts with the injury team
- Finalizing and testing the photographs showing various conditions of the lake and river
- Preparing and testing illustrations of (1) the overall area, (2) connection of surface and groundwater, and (3) application of alum as the hypothetical accelerated cleanup technique

- Conducting a peer review of the instrument as it stands at that point
- Alternative descriptions of the level or duration of injury (bounding likely modeling results).

Once these tasks are completed, we will require injury team descriptions of the likely shape of the recovery path (Line 2 in Figure 3) for the key environmental services from the river, lake, and groundwater, particularly as algae and bacteria affect them. At that point, the economics team will be "on hold" until the injury team's modeling efforts are sufficient to predict Line 2 with reasonable confidence.

Once we have reasonable estimates of Line 2, the economics team will focus on finalizing the accelerated recovery pathway (Line 1) for each category of the services. We will need advice from the injury team about how to make this scenario as plausible as possible.

After Lines 1 and 2 are adequately described, we can move toward an instrument for pre-test in two steps. First, we will need to vet the semi-final pretest instrument in focus groups and one-on-one cognitive interviews that will be conducted by members of the economics team. That likely will take approximately one month. Second, we will need to finalize our current planning for survey implementation with Westat. Westat must hire and train qualified field operatives and develop survey samples before administration of the pretest instrument in the field. It will take at least one month after Westat receives the pretest instrument from us for the actual interviews to begin.

Our proposed schedule includes two pre-tests of the instrument over five months. Upon completion of the pre-tests, Phase I of the project will be completed and we will be immediately ready to undertake Phase II of the project. The following key actions must take place prior to the pretests:

- Finalization of the survey instrument components, such as photographs, illustrations, and alternative descriptions (May and early June 2007)
- Scientific review of survey facts (June 2007, if practical)
- Peer review of the instrument (late June 2007, if practical)
- Modeling of river, lake, and groundwater recovery rates (to be determined).

The first three key actions probably can be completed in June if injury team members are available for the scientific review. However, injury team modeling results must also be completed and integrated into the instrument before pre-testing it in the field. Our Phase I schedule anticipates that the first pre-test will occur in July 2007. However, the pre-test cannot

occur sooner than one month after delivering the reviewed survey instrument to Westat. Therefore, we need to determine when the modeling results will be available to determine whether our schedule needs to be altered. Phase II of the project includes implementation of the survey instrument to the general population of the state, data analysis, and report development. Phase II is scheduled to take seven months to complete. These schedules require authorization for Phase II prior to implementation of the second pretest. The need for injury modeling results is the main uncertainty regarding whether we will continue to remain on schedule, as originally proposed.

3. Conclusion

The economics team is committed to trying to stay on schedule and we feel that issues mentioned here are sufficiently serious to warrant a face-to-face meeting with the legal team as soon as possible. In addition, we recommend that this memorandum (or portions of it) be shared with the injury team to help them understand the information required for the survey instrument. Finally, we recommend a meeting between the injury and economics teams in the near future to further discuss these issues and plan a detailed course for the coming months.

Attachment: Draft Scenario Information for Scientific Fact Checking

Section 1

In the 1970s, the water in these streams was clear and clean, and it was easy to see rocks on the bottom.

Smallmouth bass and other fish had lived in the river for centuries. They ate plants and small insects living in the river.

And, many people enjoyed this area by visiting it for sightseeing, fishing, canoeing, and other activities.

In the lake, the water was clear enough so you could see down at least twelve feet. Many people enjoyed the lake's scenic beauty and visited it for sightseeing and recreation.

Some of the water in the river and lake was also used as drinking water. And many people in the area used wells to get the groundwater for drinking and other activities in their homes and businesses.

Section 2

In 1970, Oklahoma passed a law naming some rivers in the state "Scenic Rivers." The lawmakers believed that these rivers had unique natural scenic beauty, important fish and wildlife, and excellent opportunities for outdoor recreation.[4]

Oklahoma lawmakers named them "scenic rivers" to protect them in their natural state, for fish and wildlife, and for recreation.

The picture on the right shows a thick layer of algae. Algae like this occurs sometimes in some areas between spring and fall. This algae is sometimes called moss.

Although the water in the river used to be clear all the time, excessive algae now causes it to turn brown or green much of the time, and makes it hard to see the rocks on the bottom.

This algae has affected which types of plants and animals can live in the river. Many of the smallmouth bass, other fish, insects, and small plants that used to live in the river are no longer there, because they can't live where there is so much algae. In some places, 10% of these species

4. Oklahoma Scenic Rivers Act, 82 O.S. § 1451-1470 as amended through 29 June 1983, Section 1452; http://www.americanrivers.org/site/DocServer/ok_code.pdf?docID = 716.

have disappeared. In other places, more have disappeared, as much as half in some places. Other species that do well in water with lots of algae, such as catfish,[5] have become more common.

Sometimes, the surface of the river gets covered in places by a thick layer of algae that smells bad after it's been there for a while.

Algae in the water and on the rocks dies and decomposes gradually over time, and this uses up oxygen in the river. Sometimes, this causes many fish to die all at once, because they can't breathe. This is called a "fish kill."

In Tenkiller Lake, you used to be able to see down at least 12 feet. Now, at the north end of the lake, where the river comes in, you can often only see down about 2 feet between spring and fall because of algae. As you move south toward the dam, there is less and less algae. Near the dam, you can still see down at least 12 feet all year long.

In the shallow areas around the edge of the lake, the bottom is often covered with algae between spring and fall.

After algae dies, it decomposes, which uses up oxygen. In large parts of the lake, there is so little oxygen during the summer that many fish species can no longer live in those parts of the lake. These species include fish that are popular with anglers like largemouth bass and smallmouth bass. Lack of oxygen limits how many fish can live in a lake, and how fast they grow.

Other types of fish that thrive where there is a lot of algae and limited oxygen are probably increasing in numbers.

Insects and small animals that would normally be found on the bottom of the lake are now missing from large areas of the lake. The most likely cause is lack of oxygen.

Because there is a lot of algae in the drinking water from the river and lake, it sometimes smells and tastes bad when it is delivered to homes and businesses. In recent years, many people using this water have complained about the smell or taste.

In addition, two problems related to human health have arisen. First, in some parts of the river, there are now 10 to 100 times more bacteria than there were in 1970. In many areas, there is more bacteria than the federal and state governments think is safe for drinking and for activities in the water like wading and swimming.

These bacteria are also in the groundwater. Many people drink this groundwater from wells that have not been treated or cleaned.

5. Slide 22 and 23 from Jan Stevenson's presentation October 25-26, 2006.

These bacteria can cause nausea, cramps, diarrhea, and vomiting. Children, elderly people, and people with weakened immune systems are more likely to get sick in these ways.

Public health officials continue to find more bacteria than is safe in the river and groundwater. But, there is no way to know for sure that anyone has gotten sick from bacteria in this water.

In the lake, the bacteria are diluted by the large amount of water, so they pose no threat to human health.

The second problem happens when river and lake water is cleaned to remove bacteria and other things, so people can drink it. When water with lots of algae in it is processed in some treatment plants, chemicals that can cause cancer are created. Much of the drinking water made from river and lake water has more of these chemicals in it now than the government thinks is safe. The Oklahoma Department of Environmental Quality has said that drinking this water for a few years is not dangerous, but drinking it for many decades may increase the risk of getting cancer.

Section 3

Many scientists have studied why these changes have happened to the river, lake, and groundwater.

Some of these scientists work for the State of Oklahoma; others are researchers at Oklahoma universities, other universities, and research organizations.

They agree that these changes in the river, lake, and groundwater are caused mostly by increasing human activities.

Most of the problem is due to the increasing number of chickens and turkeys being grown in the area around the Illinois River and Tenkiller Lake. Now, more than 100 million chickens and turkeys are raised each year in areas that drain into the river and lake.[6] This means that chicken and turkey farms put out over a hundred thousand tons of what is called "poultry litter" each year.[7] Poultry litter is mostly chicken and turkey droppings mixed with wood shavings and other materials used on the floors of chicken houses.

For many years, farmers have been collecting the poultry litter and spreading it on the land nearby. The litter contains phosphorus and other things that help plants grow. But now, there is much more phosphorus than plants can use.

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6. Bert Fisher, personal communication, including draft document, "Estimating the commercial poultry population and poultry waste generation within the Illinois River Watershed."

7. Ibid.

This extra phosphorus stays on the land, and each time it rains, some of the phosphorus is washed into the river, lake, and groundwater. This phosphorus causes algae to grow in the river and lake.

Poultry litter also contains bacteria, and this bacteria has been slowly washing into the river and groundwater as well.

Most of the phosphorus in the river, lake, and groundwater comes from poultry litter. Some phosphorus comes from other sources as well. More homes and businesses have been built in the area, and more people are living and working there. These people have been putting fertilizer containing phosphorus on the land to grow plants. Households and businesses such as nurseries and golf courses do this. Farmers in the area sometimes use fertilizers other than poultry litter that contain phosphorus. Also, sewage treatment plants take human waste, process it, and put it into the river. The treated sewage contains phosphorus. And at people's homes far away from cities, underground septic tanks contain human waste. When septic tanks leak, phosphorus and bacteria get into the groundwater.

Scientists have measured how much phosphorous comes into the area from each possible source. They have found that about 70% of the phosphorus in the river, lake, and groundwater is from chickens and turkeys.

Phosphorus in the river, lake, and groundwater causes algae to grow fast between the spring and fall. The algae coats rocks, makes the water murky, affects the fish, insects, and small plants, and has the other effects I mentioned earlier.

Section 4

Because there are many causes of algae and bacteria around Oklahoma, algae and bacteria are problems in many rivers and lakes throughout the state, and people are working to clean them up. However, the State of Oklahoma is putting extra effort into cleaning up the Illinois River, Flint Creek, and Barren Fork Creek because they are Scenic Rivers, and Oklahoma law requires that they be kept clean. Because Tenkiller Lake is so popular for recreation, some people are especially interested in cleaning it up as well.

A lot of phosphorus and bacteria remains on the land from past spreading. Rain would slowly wash that phosphorus and bacteria into the river, lake, and groundwater for many years. Each year, less and less phosphorus would be carried into the river, lake, and groundwater. The bacteria would be washed away more quickly but would not return to 1970 levels in the river, lake, and groundwater for some time.(we are saying at least 70 years for just the moratorium)

Because the river flows into the lake, the phosphorus and bacteria in the river are washed into the lake, and are kept there by the dam. Phosphorus would slowly be covered by clean dirt at the bottom of the lake, which would seal it off so that algae couldn't grow.

After harmful spreading of poultry litter is banned, scientists say, the water in the river and lake would gradually become clearer and would smell and taste better. The river and lake would eventually return to what they were like in 1970. There would be less algae; species of fish, insects, and plants that used to be common in the river's clear waters would increase in numbers, replacing those that live in water with lots of algae; there would be fewer fish kills; Tenkiller Lake's fish habitat would improve, and there would be a lot less cancer-causing chemicals in treated drinking water.

There would be some improvements right away, but most of the benefits would come much later. It would happen more quickly in the river than in the lake. The river would gradually improve but it wouldn't be back to what it was like in 1970 for about 50 years. The lake would improve more slowly, and would be back to 1970 conditions in 60 to 70 years.

If harmful spreading of poultry litter is banned, bacteria would die off quickly and would be back to 1970 levels in about 10 years.